

# Visual Analysis of Children's Furniture Design in China Based on Citespace

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**Abstract:** This paper provides a systematic review of papers in children's furniture design research through the CiteSpace visualization tool. We analyzed 446 papers on this field of research from CNKI and found the most influential publications, authors, journals, and institutions. In addition, we explored the current status of hotspots in this research field and predicted the future development trend through the analysis of keywords and Burst Keywords. The results show that the research field of children's furniture design in China is divided into ten major clusters, which can be grouped into three research areas, namely, basic research on children's furniture design, child-oriented design concept, and principles of children's furniture design. The future trends of children's furniture design are safety, child-centred, and humanization. The analysis of the research results in this field through CiteSpace software can enhance the understanding of the research in this field and provide a partial reference for the future research field of children's furniture design.

**Keywords:** CiteSpace, Visualization, children, furniture design, CNKI

## 1. Introduction

Children's furniture is a refined branch of the modern furniture industry, including children's beds, wardrobes, desks, and chairs. At the same time, it is also a particular field. Its consumer group is children, generally referring to anyone under 18, because of the particularity of children's physiology, so there are higher requirements for children's furniture design. Therefore, this study uses CiteSpace visualization analysis software to conduct a comprehensive analysis of the research subjects, research institutions, research hotspots, research contents and development trends of research literature on children's furniture design from 2002 to 2021 to explore better the frontier hotspots and development trends of children's furniture design and provide ideas and references for subsequent children's furniture design.

## 2. Materials and Methods

### 2.1 Literature Sources

CNKI is a comprehensive database that mainly focuses on Chinese literature and integrates the abstract search of several foreign language databases, including almost all literature types and

disciplines.[1] With "Children's furniture Design" and "children's home design" as the keywords, the search time range is from 2002 to 2021, the journal type is set as all journals, and 605 pieces of literature are retrieved, excluding design works, competition call for papers, exhibition overview, news, policies and regulations. 443 papers were selected and exported in RefWorks format as the final research data.

## 2.2 Research Methods

### 2.2.1 Set the citespace parameter

Bibliometric analysis is a quantitative method for reviewing and describing published papers that helps researchers to assess scholarly research in a focused area.[2, 3] Scientific cartography is used to explore the structure and evolution of the focused research areas.[4-6] In this thesis, both of these analysis methods were used to know the analysis with the help of citespace.5.8.R3 and excel2201 software. Enter the interface of citespace software set the parameters of the software as follows: Time Slicing is set to 2002 to 2021, time slice is set to 1, node type is set to author, institution, and keyword in order. Pruning is set to pathfinder, and other parameters are kept as default.

### 2.2.2 Mapping and analyzing data

Firstly, we use CiteSpace to map authors' knowledge and issuing institutions. Then use Excel to draw a graph of annual posting volume, reflecting the overall situation of children's furniture design research field. Next, the keyword evolution map, keyword clustering map, and emergent word map of children's furniture design are drawn with citespace. Finally, based on the frequency of these popular keywords, the hot spots of research in children's furniture design were identified. And a timeline analysis of the origin, status and development of these researches is conducted.

## 3. Analysis of research results

### 3.1 Analysis of annual publication volume

Figure 1 shows the number of articles published in children's furniture design in CNKI. The trend line of articles published in CNKI shows that Chinese children's furniture design research has three stages. From 2002 to 2008, the first stage was when only a few papers were published each year, the nascent stage of children's furniture design. Since 2001 children's furniture has been independent of the furniture industry until 2003 when it gradually developed and grew. The second phase was from 2009 to 2015, with continuous growth in published articles. Since the official implementation of the General Technical Conditions for Children's Furniture in 2012, China's children's furniture products have normative technical indicators, children's furniture industry will achieve more significant development opportunities.[7, 8] The last period is from 2016 to 2021. Children's furniture design

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Figure 3 shows the authors of articles published in this field in CNKI. The larger the name shown indicates, the more influential the author is in the field. Yanfeng Miao is the most prolific author, having published eight articles during our search period. Her areas of interest are mainly environmental art design, interior design, and furniture design. Dongjiu Yu published six articles during my search, making him the second most prolific scholar in the field in China. He specializes in product design industrial design. She has a clear understanding of groundbreaking research in innovative design. She has studied innovative high-tech products such as strollers, shopping carts for the elderly, and fitness chairs. Na Yu is interested in intelligent furniture and product platforms and is the third-ranked scholar with six publications during my search. In addition, Fan Zhang, Wei Xu and Huiyuan Guan are also educational systems with high publication volume in terms of cooperation. The cooperation among authors is not close, and each author should strengthen scientific collaboration.

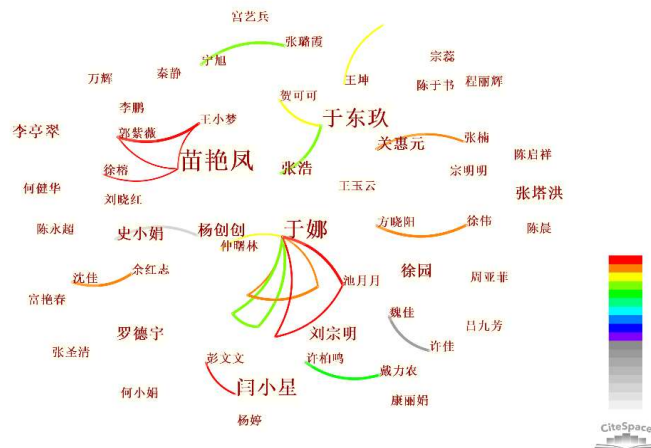


Figure3 Distribution of authors of articles in the field of children's furniture design

### 3.3 Analysis of published journals

The statistics of published journals can help scholars quickly find their target journals and help journals grasp the direction of the publication. According to the visual analysis data of CiteSpace, the bar chart of the top 10 journals in this field was made by Excel (Figure 4). Based on the data, it can be seen that the most published journal in the field of children's furniture design from 2002 to 2021 is Furniture and Interior Decoration (16 articles), which is a core Chinese source journal of Peking University sponsored by Central South University of Forestry Science and Technology, and the collection of essays includes link art, brand planning, design cases and other aspects. The next is Packaging Engineering (14 articles) and Furniture (14 pieces); Packaging Engineering is also a core source journal of Peking University; the journal columns include industrial design, visual communication design, design seminars, etc. Furniture is also a professional journal with relatively high-quality articles, and its columns include reviews, applied technology, design research, classical

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Table 1 Top 15 keywords in the field of children's design research in CNKI

Year	keywords	count	cent
2003	Children's furniture	252	1.18
2002	Design	61	0.37
2004	Furniture Design	50	0.23
2002	Children	37	0.10
2008	Growability	25	0.13
2002	Furniture	24	0.07
2004	Safety	21	0.09
2013	Modularity	16	0.06
2012	Parent-child interaction	10	0.02
2014	Bionic Design	10	0.01
2006	Color	9	0.01
2010	Design principles	9	0.02
2006	Development trends	8	0.02
2011	Product design	8	0.03
2011	Fun	8	0.01

### 3.5 Keyword clustering time zone graph analysis

There are 359 nodes and 705 connected lines in the knowledge graph of keywords in this research area in CNKI from 2002 to 2021, with a density value of 0.011; the modularity value is 0.6017, and the modularity Q is a value between 0 and 1, and the closer the Q value is to 1, the stronger the clusters are connected. The Silhouette value is 0.9017, and the clustering result is reasonable when the Silhouette value is more significant than 0.5. A total of 10 clusters were obtained using the LLR algorithm, which can be divided into three research areas by observing the clustering keywords in Figure 6.[10]

The first area is basic research on children's furniture design, including "#0 children's furniture", "#1 furniture design", "#2 design", and "#8 design methods" in four clusters. The main keywords in "#0 children's furniture" are bionic design, Chinese patterns, and pine wood. The main keywords in "#1 furniture design" are geometric shape, creativity, decorative colour." The main keywords in "#2 design" are scale, appearance, Chinese elements, interior design." The keywords in the "#8 design method" cluster are traditional culture, patterns, symbols, and design methods. Overall, furniture design is the foundation of the furniture industry, and children's furniture design is a branch of furniture design. A piece of furniture requires a series of processes: first, the design concept sketch; then, collect design information about the furniture materials, technology, structure; finally, draw three views and make a model. It can be seen that the children's furniture design link is an important part of the furniture from the idea into the physical.

The second area is child-centred design concepts, including "#3 Children" "#4 Grow ability," "#5 Preschoolers", and "#9 Psychology ". The main keywords clustered in "#3 Children" are children, children's room, mindfulness, and development. "The keywords clustered in "#4 Grow ability" are gender, children's table and chairs, and life cycle. The main keywords in "#5 preschoolers" are safety, children's age, growability, and personality. The main keywords in the #9 psychological cluster are different ages, psychological, and participatory. These keywords are related to "people" and can be used as a category. From this, we can find that the "human-centred" design concept is one of the current hot spots in children's furniture design.

The third area is children's furniture design principles, including "#6 design principles," "#7 multifunctionality," "#10 accessibility links," and "#6 design. The main keywords in the "#6 Design Principles" cluster are product quality, sustainability, and modularity. The keywords in the "#7 Multifunctionality" cluster are multifunctionality, safety, safety and environmental protection." The main keywords in the "#10 Accessibility" cluster are elderly, office space, public buildings.

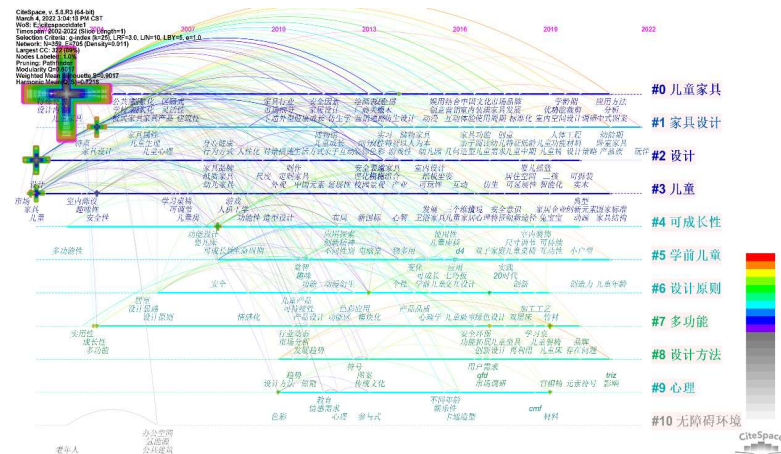


Figure 6 Keyword clustering time zone map in the field of children's furniture design

### 3.6 Burst term analysis

Burst term is a high-frequency keyword that appears suddenly in a specific period, and burst term can grasp the research hotspots in the field in a specific period. The figure shows the chart of this field in CNKI drawn in citespace. Observation of CNKI's emergent word mapping can be found. The research on children's furniture design in China can be divided into three stages. The first stage is 2006 to 2014, the keywords in this stage are children's psychology, safety. 2003 children's furniture development and growth, 2012 China released the General Technical Conditions for Children's Furniture, Chinese children's furniture products have normative technical indicators, safety has become a hot spot. From 2015 to 2019, the research hotspots are kindergarten, modularity, green design, and colour. In 2015, the Party's fifth session of the 18th Central Committee established five major development concepts, including green development. The trend of the modern furniture industry at this time is the green manufacturing of children's furniture. The third stage is 2019-2021,

research hotspots for innovative design, children's dining chairs, can grow. In 2017 the State Council issued the "Thirteenth Five-Year" National Science and Technology Innovation Plan and "Made in China 2025" China began to implement the strategy of innovation-driven development. This stage of the children's furniture industry planning is also around the strategic development of China, so the above research hotspots have emerged.

#### 4. Conclusion

This paper uses CiteSpace software to analyze the annual publication volume, author distribution, journal type, keyword clustering, and emergent words of 443 documents in the field of children's home design in the CNKI database. It concludes that: First, the current research institutions are mainly colleges and universities, while enterprises and research institutes publish fewer papers, and there is a lack of cooperation among institutions. In addition, the regions with more publications are mainly large cities in eastern, central and southern China, and more minor in western and northeastern China. The cooperation and communication among institutions and regions should be strengthened. Second, the authors with more publications are mainly Yanfeng Miao, Dongjiu Yu, Na Yu, Fan Zhang, Wei Xu and Huiyuan Guan. The cooperation between authors is not close, and each author should strengthen scientific collaboration. The journals with more volume of papers published in children's furniture design are Furniture and Interior Decoration, Packaging Engineering, Furniture, Forestry Engineering, Popular Literature and Art, Industrial Design, Art Grand View, Art and (Theory), Design. The quality of the journals is relatively high, with a large proportion of art and engineering journals. Third, the current hotspots in the field of children's furniture design research in China are: in the early stages of children's furniture design research field hotspots to children's psychology, security; the middle of the hotspot shift to kindergarten, modular, green design; the current stage to innovative design, children's dining chairs, can grow as hotspots. 2002 to 2021, the field of research hotspots is divided into three areas, primarily including children's furniture design Basic research, child-oriented design concept, children's furniture design principles. Fourth, the future of China's children's furniture design research field for the development trend: the design of children's furniture will focus more on child-centred, based on children's physiological and psychological development to design furniture that responds to the growth of children. In addition, safety is the keyring of children's furniture design. Pay attention to the humane details of the invention. Pay attention to the harmonious unity of the creation of people and links. Children's furniture design should be educational and fun, drawing on the fun, humane toy design, not only to meet the practical functions of children's furniture but also to highlight the additional functions of children's furniture.

#### Contribution

This paper presents a bibliometric analysis of the field of children's furniture design using CiteSpace software. Correlated with the writing retrospect approach, it offers a clear and comprehensive picture of the structure and changes in the research in children's furniture design. And the knowledge mapping can help some researchers in the area to have a profound comprehension of



the advancement of the field. This paper can still help researchers rapidly discover the references, gazettes, authors, and research hotspots they need. In addition, this treatise can also be used as a submission guide when researchers need to submit their papers. Finally, the forecasts based on the citespace bibliometric review can also inform future investigations on children's furniture design.

## Restrictions

With the bibliometric analysis, this review depicts a more holistic model of investigation in children's furniture design to serve as a source of reference for future academics in the field of furniture design. Nevertheless, there are restrictions to this research. First, the specimen in our research was finite to CNKI academic journals and did not include doctoral dissertations, master's theses, or conference papers. Second, to ensure the quality of the study, the data sources in this study were limited to two types (articles and comments). Morro exploration could extend the information accumulation to other kinds of magazines (e.g., conference papers, news)

## References

- [1] Ji, J. M., & Sun, J.Q. (2010). A Guide to Literature Retrieval and Knowledge Discovery. Shanghai: East China University of Science and Technology Press, 307.
- [2] Chen, C. (2006). CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature. *Journal of the American Society for Information Science and Technology*, 57(3), 359-377.
- [3] Rey-Marti, A., D. Ribeiro-Soriano., & D. Palacios-Marques., (2016). A bibliometric analysis of social entrepreneurship. *Journal of Business Research*, 69(5), 1651-1655.
- [4] Cobo, M. J., et al., (2011). Science Mapping Software Tools: Review, Analysis, and Cooperative Study Among Tools. *Journal of the American Society for Information Science and Technology*, 62(7), 1382-1402.
- [5] Chen, C., R. Dubin., & M. C. Kim. (2014). Emerging trends and new developments in regenerative medicine: A scientometric update (2000-2014). *Expert Opinion on Biological Therapy*, 14(9), 1295-1317.
- [6] Chen, C., et al. (2012). Emerging trends in regenerative medicine: A scientometric analysis in CiteSpace. *Expert Opinion on Biological Therapy*, 12(5), 593-608.
- [7] Chen, Y. C., & Peng, X. X. (2015). Preliminary analysis of the current situation of China's children's furniture industry. *Forest Products Industry*, 42(08), 10-12.
- [8] Ren, Y., & Qin, J. (2018). The current situation and future development trend of children's furniture in China. *Furniture*, 39(01), 52-55.
- [9] Liu, X. H., & Zeng H. (2005). Analysis of domestic children's furniture market. *Furniture*, (03), 53-56.
- [10] Rousseeuw, P.J., (1987). Silhouettes: A graphical aid to the interpretation and validation of cluster analysis. *Journal of Computational and Applied Mathematics*, 20(C), 53-65.